Heart failure is a major and growing health concern in the UK and is still associated with a high morbidity and mortality despite progress in its diagnosis and treatment. The National Service Framework for coronary heart disease (CHD) sets national standards of care relating to CHD, including providing better care for patients with heart failure. The National Institute for Health and Clinical Excellence and the Scottish Intercollegiate Guidelines Network have both issued guidelines for the management of people with chronic heart failure.

Definition

Many definitions of heart failure have been documented over the past 50 years. These definitions tend to include the features of heart failure such as haemodynamics, oxygen consumption, or exercise capacity. Guidelines from the European Society of Cardiology (2008) set out the defining features of heart failure (shown in Box 1, p115).

Heart failure can also be defined as:

- New-onset
- Transient
- Chronic

New-onset heart failure refers to the first presentation of the disease. Transient heart failure refers to symptomatic heart failure over a limited period of time after which patients recover from the syndrome. Examples include patients with mild myocarditis, post myocardial infarction (heart failure resolved by diuretics administered in a coronary care unit), or heart failure due to ischaemia (resolved by coronary revascularisation).

Chronic heart failure is the most common type that requires hospital admission. Treatment is based on patients’ clinical presentation (see accompanying article, p120).

Classification

Two classifications of the severity of heart failure are described in the ESC guidelines, as shown in Box 2 (p115). The New York Heart Association functional classification is based on symptoms and exercise capacity and is...
Symptoms such as breathlessness at rest or with exercise, fatigue, tiredness, ankle swelling

Signs such as tachycardia, tachypnoea, hepatomegaly

Objective evidence of structural or functional abnormality of the heart at rest — cardiomegaly, third heart sound, cardiac murmurs, abnormality on echocardiogram, raised natriuretic peptide concentration

The Framingham heart study, which had a cohort of 5,209 subjects, has been followed up biennially since 1948. This dataset has been used to obtain some information on the incidence and prevalence of heart failure, defined using clinical and radiographic criteria. The Framingham heart study reported that the age-adjusted prevalence of heart failure was similar for men and women during the 1980s. This prevalence increased significantly with increasing age (doubling the rate of prevalence with each decade of ageing).

Heart failure accounts for at least 5% of admissions to hospitals in the UK. Hospital admission for heart failure accounts for approximately 1% of the total healthcare expenditure in the UK. Epidemiological studies have shown that the financial burden of heart failure on health services is increasing. Hospital admissions and GP consultations occur frequently following diagnosis and readmission rates among the elderly range from 29% to 47% within three to six months of the initial hospital discharge.

The prevalence of heart failure is 2–3%, rising sharply at around 75 years of age. In the younger population, heart failure is more common in men, with the cause attributed to coronary heart disease. Prevalence is similar between older men and women. Although some patients live for many years, overall 50% of patients will have died four years after diagnosis.

Causes

ESC guidelines state that the most common reasons for functional deterioration of the heart are damage or loss of heart muscle, acute or chronic ischaemia, increased vascular resistance with hypertension, or the development of a tachyarrhythmia such as atrial fibrillation.

Causes of heart failure therefore include:

- Coronary artery disease (myocardial infarction, ischaemia)
- Hypertension
- Cardiomyopathy
- Congenital heart disease
- Arrhythmias (tachycardia and bradycardia)
- Alcohol
- Medicines (calcium antagonists, antiarrhythmics, cytotoxic drugs)

Pathophysiology

Heart failure is a multisystem disorder associated with systolic and diastolic dysfunction of the myocardial tissue. It is characterised by abnormalities of cardiac, skeletal muscle and renal function; stimulation of the sympathetic nervous system; and a complex pattern of neurohormonal changes.

**Myocardial systolic dysfunction** Myocardial systolic dysfunction is described by impairment of left ventricular function, which leads to a fall in cardiac output. This in turn leads to activation of neurohormonal compensatory mechanisms aiming to improve the mechanical capacity of the heart, as shown in Figure 1 (p116). It has been estimated that 30–40% of patients with heart failure have normal ventricular systolic contraction.

**Myocardial diastolic dysfunction** Myocardial diastolic dysfunction occurs because myocardial relaxation is compromised, causing stiffness in the ventricular wall and impairment of diastolic ventricular filling.
Symptoms
The most common symptoms of chronic heart failure include dyspnoea, fatigue, lethargy and oedema. Breathlessness on exertion is particularly common in heart failure, particularly in patients with comorbid pulmonary disease.

Orthopnoea is thought to be a more specific symptom, and paroxysmal nocturnal dyspnoea has a greater predictive value for heart failure as it results from increased left ventricular filling pressure. Fatigue and lethargy are related to skeletal muscle abnormalities and impaired muscle blood flow. Swelling of ankles and feet (oedema) is also commonly seen when patients present with heart failure.

Although there seems to be a poor relationship between symptoms and the severity of cardiac dysfunction, symptoms tend to correlate well with prognosis. Symptom control can be used effectively for monitoring the effects of therapy.

Diagnosis
There are several diagnostic techniques that can be used to determine heart failure. NICE’s diagnostic algorithm is reproduced in Figure 2 (p119).

Clinical examination
The symptoms and signs of heart failure are crucially important for early identification of heart failure. The ESC guidelines recommend the clinical assessments described in Box 3, including observation, palpation and auscultation.

Electrocardiogram
An electrocardiogram (ECG) is taken routinely for all patients with suspected heart failure. Although an abnormal ECG has little predictive value for heart failure, a completely normal ECG would mean that systolic dysfunction is unlikely.

Common ECG abnormalities in patients with heart failure can include: sinus tachycardia; sinus bradycardia; atrial tachycardia, flutter or fibrillation; ventricular arrhythmias; ischaemia; left ventricular hypertrophy; and atrioventricular block.

Chest X-ray
Chest X-ray is an important diagnostic tool for patients with suspected heart failure and it can also be used to monitor the response to therapy. Chest X-ray may show cardiac enlargement (including cardiomegaly), pulmonary venous congestion, pleural effusion, and pulmonary infection or infiltration.

Natriuretic peptides
The heart secretes natriuretic peptides as a homeostatic signal to maintain stable blood pressure and prevent excess salt and water retention. Atrial natriuretic peptide (ANP) has been identified in the atrial myocardium. B-type natriuretic peptide (BNP) is primarily secreted by the ventricles in the heart as a response to ventricular stretching or wall tension.6

BNP levels can be used to assess cardiac function, to help diagnose heart failure, including diastolic dysfunction, and to monitor the success of treatment. However, the use of BNP testing has been controversial because of its cost and also because BNP levels can be increased in pulmonary or renal diseases. Nevertheless, BNP concentrations are thought to correlate well with severity of heart failure and prognosis.

Troponins
Troponin I or T levels are mainly used to determine myocyte necrosis in acute coronary syndrome and hence can identify potential candidates for coronary revascularisation. Troponin levels are also raised in acute myocarditis and in severe heart failure or during a period of acute fluid overload (ie, decompensation, for example due to ischaemia or sepsis).

The combination of increased troponin levels and an increased BNP level is a strong marker for the presence of heart failure.

Echocardiography
Echocardiography is the most useful non-invasive tool for the assessment of left ventricular dysfunction and, ideally, should be used for all patients with suspected heart failure.

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<th>Box 3: Clinical examination</th>
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<tr>
<td><strong>Appearance</strong></td>
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<td><strong>Pulse</strong></td>
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<td><strong>Blood pressure</strong></td>
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<td><strong>Fluid overload</strong></td>
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<td><strong>Lungs</strong></td>
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<td><strong>Heart</strong></td>
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Echocardiography allows a quantitative measurement of the left ventricular ejection fraction (LVEF normal >45%), which in turn is well correlated with the outcome and survival of patients with heart failure. Advances in echocardiography using contrast agents have allowed for observation of left ventricular walls in more detail. Common echocardiographic abnormalities observed in heart failure include: reduced left ventricular ejection fraction, increased left atrial size, left ventricular thickness, and valvular stenosis or regurgitation.

Greater availability of echocardiography services for heart failure patients in primary care has the potential to improve patient's prognosis through speedier diagnosis.

Cardiac catheterisation
Cardiac catheterisation is not used routinely for the diagnosis or management of heart failure. It is considered useful for heart failure patients with a history of angina or ischaemic left ventricular dysfunction. It may also be used for patients with refractory heart failure of unknown cause.

Pulmonary function testing
Spirometry is useful for excluding respiratory causes of breathlessness and to evaluate the severity of concomitant pulmonary disease.

**Prognosis**
Determining an individual heart failure patient's prognosis is difficult, with many factors complicating the picture. These factors include: advanced age; ischaemia; arrhythmias; marked elevation of BNP; low LVEF; and presence of other diseases such as diabetes, renal dysfunction, anaemia, chronic obstructive pulmonary disease and depression.

**References**